| FORM PTO-1390 (Modified) (REV 11-98) | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | ATTORNEY'S DOCKET NUMBER |
|---|---|---|
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | 112740-151 |
| | | U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/806,122 |

| INTERNATIONAL APPLICATION NO. PCT/DE99/02926 | INTERNATIONAL FILING DATE 15 September 1999 | PRIORITY DATE CLAIMED 30 September 1998 |
|---|---|---|

**TITLE OF INVENTION**
**METHOD FOR MODIFYING THE TRANSMISSION-ORIENTED VARIABLES OF A MONITORING PROCEDURE**

**APPLICANT(S) FOR DO/EO/US**
**Herbert Heiss**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☐ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.

2. ☒ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.

3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).

4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☐ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))

    a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).

    b. ☐ has been transmitted by the International Bureau.

    c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).

6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. ☐ A copy of the International Search Report (PCT/ISA/210).

8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))

    a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).

    b. ☐ have been transmitted by the International Bureau.

    c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.

    d. ☐ have not been made and will not be made.

9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).

11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).

12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

**Items 13 to 20 below concern document(s) or information included:**

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

15. ☐ A **FIRST** preliminary amendment.

16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.

17. ☐ A substitute specification.

18. ☐ A change of power of attorney and/or address letter.

19. ☒ Certificate of Mailing by Express Mail

20. ☐ Other items or information:

07/16/2001 SHAJARRO 00000102 09806122

01 FC:154                130.00 OP

PCTUS1/REV03

| FORMPTO-1390(Modified)(REV.1-98)          U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | ATTORNEY'S DOCKET NUMBER |
|---|---|
| **TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371** | 112740-151 |
| | U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR **09/806122** |

| INTERNATIONAL APPLICATION NO. PCT/DE99/02926 | INTERNATIONAL FILING DATE 15 September 1999 | PRIORITY DATE CLAIMED 30 September 1998 |
|---|---|---|

TITLE OF INVENTION

**METHOD FOR MODIFYING THE TRANSMISSION-ORIENTED VARIABLES OF A MONITORING PROCEDURE**

APPLICANT(S) FOR DO/EO/US

**Herbert Heiss**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

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    a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).

    b. ☐ has been transmitted by the International Bureau.

    c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).

6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. ☒ A copy of the International Search Report (PCT/ISA/210).

8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))

    a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).

    b. ☒ have been transmitted by the International Bureau.

    c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.

    d. ☐ have not been made and will not be made.

9. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).

11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).

12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

**Items 13 to 20 below concern document(s) or information included:**

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

15. ☒ A **FIRST** preliminary amendment.

16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.

17. ☐ A substitute specification.

18. ☐ A change of power of attorney and/or address letter.

19. ☒ Certificate of Mailing by Express Mail

20. ☒ Other items or information:

    **Submission of Drawings - Figures 1-3 on two sheets**

PCTUS1/REV03

| U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR) 09/806122 | INTERNATIONAL APPLICATION NO. PCT/DE99/02926 | ATTORNEY'S DOCKET NUMBER 112740-151 |
|---|---|---|

21. The following fees are submitted:.

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :**

☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO ........... $1,000.00

☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but Internation Search Report prepared by the EPO or JPO ......... $860.00

☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ........... $710.00

☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ........... $690.00

☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ......... $100.00

| CALCULATIONS | PTO USE ONLY |
|---|---|

**ENTER APPROPRIATE BASIC FEE AMOUNT =** $860.00

Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). $0.00

| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | | |
|---|---|---|---|---|---|
| Total claims | 7 - 20 = | 0 | x $18.00 | $0.00 | |
| Independent claims | 1 - 3 = | 0 | x $80.00 | $0.00 | |
| Multiple Dependent Claims (check if applicable) . | | | ☐ | $0.00 | |

**TOTAL OF ABOVE CALCULATIONS =** $860.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable) . ☐ $0.00

**SUBTOTAL =** $860.00

Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). + $0.00

**TOTAL NATIONAL FEE =** $860.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐ $0.00

**TOTAL FEES ENCLOSED =** $860.00

| Amount to be: refunded | $ |
|---|---|
| charged | $ |

☒ A. check in the amount of **$860.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

William E. Vaughan
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, IL 60690-1135

SIGNATURE

William E. Vaughan
NAME

39,056
REGISTRATION NUMBER

March 28, 2001
DATE

IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

### PRELIMINARY AMENDMENT

APPLICANT: Herbert Heiss                ATTORNEY DOCKET NO.: 112740-151

SERIAL NO.:

INTERNATIONAL APPLICATION NO: PCT/DE99/02926

INTERNATIONAL FILING DATE: 15 September 1999

INVENTION:  METHOD FOR MODIFYING THE TRANSMISSION-ORIENTED
VARIABLES OF A MONITORING PROCEDURE

Assistant Commissioner
Patent and Trademark Office
Washington, D.C. 20231

S I R:


Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. § 371 as follows:

### In The Specification:


On amended page 1, cancel lines 1-4, and substitute therefor

--S P E C I F I C A T I O N

### TITLE

**METHOD FOR MODIFYING THE TRANSMISSION-ORIENTED
VARIABLES OF A MONITORING PROCEDURE**

### BACKGROUND OF THE INVENTION

### Field of the Invention

The present invention relates to a method for modifying the transmission-oriented variables of a monitoring procedure which improves the monitoring of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility.

### Description of the Prior Art--

On amended page 1, line 13, cancel the "-" and substitute therefor a --;--.

On amended page 1, line 16, cancel "Said" and substitute therefor --Such--.

On amended page 23, cancel "This means that" and substitute therefor --As such,--.

On amended page 1a, line 1, cancel the "-" and substitute therefor a --,--.

On amended page 1a, line 2, cancel the "-" and substitute therefor a --,--.

On amended page 2, line 13, cancel "said" and substitute therefor --this--.

On amended page 2, line 28, cancel "by means of" and substitute therefor --via--.

On amended page 2a, line 12, cancel "The" and substitute therefor --An--.

On amended page 2a, line 12, cancel "forming the basis".

On amended page 2a, line 12, insert --present-- before "invention".

On amended page 2a, lines 15-16, cancel "The object is achieved by the features of patent claim 1."

On amended page 2a, after line 16, insert the following:

## --SUMMARY OF THE INVENTION

Accordingly, pursuant to the method according to the present invention, on arrival of an ATM cell for a virtual connection, a theoretical arrival time determined with the aid of a monitoring time derived from the transmission rate is determined for monitoring the next ATM cell with the aid of a monitoring procedure, both the theoretical arrival time and the monitoring time being temporarily stored in a memory unit until they are updated. After a current monitoring time has been derived from the current transmission rate in the period--

On page 3, line 11, insert --present-- before "invention".

On page 3, line 23, insert --present-- before "invention".

On page 3, lines 26-27, cancel "according to the invention".

On page 3, line 32, cancel "according to" and substitute therefor --of--.

On page 3, line 32, insert --present-- before "invention".

On page 3, line 33, cancel the "-" and substitute therefor a --,--.

On page 3, line 34, cancel the "-" and substitute therefor a --,--.

On page 3, line 36, insert a --,-- after "for".

On page 3, line 36, insert a --,-- after "case".

On page 3, line 38, cancel "This means that" and substitute therefor --As such,--.

On page 3a, line 2, insert --present-- before "invention".

On page 4, line 2, insert --present-- before "invention".

One page 4, line 9-10, cancel "-claim 2".

2

On page 4, line 15, insert --present-- before "invention".

On page 4, line 23, cancel "-claim 3".

On page 4, line 36, cancel "-claim 4".

On page 5, line 2, insert --present-- before "invention".

On page 5, line 12, cancel "-claim 7".

On page 5, line 20, insert --present-- before "invention".

On page 5, line 26, cancel the "," and substitute therefor a --;--.

On page 5, line 26, insert a --,-- after "i.e.".

On page 5, line 27, insert --present-- before "invention".

On page 5, line 27, insert --also-- after "invention".

On page 5, lines 27-28, cancel "thus also".

On page 5, line 28, insert --therefore-- after "used".

On page 5, cancel lines 31-36 and substitute the following paragraph therefor:

--Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Preferred Embodiments and the Drawings.--

On page 5, before line 1, insert the following centered heading:

<div align="center">

--**DESCRIPTION OF THE DRAWINGS**--

</div>

On page 5a, line 3, insert --present-- before "invention".

On page 5a, line 3, cancel the "," and substitute therefor a --;--.

On page 6, line 2, cancel the "," and substitute therefor a --;--.

On page 6, line 4, insert --present-- before "invention".

On page 6, before line 7, insert the following centered heading:

<div align="center">

--**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**--

</div>

On page 6, line 7, cancel "figure" and substitute therefor --Figure--.

On page 6, line 13, insert a --,-- after "shown".

On page 6, line 13, insert a --,-- after "example".

On page 6, line 13, cancel "figure" and substitute therefor --Figure--.

On page 6, line 20, cancel "figure" and substitute therefor --Figure--.

On page 6, line 21, cancel "figure" and substitute therefor --Figure--.

On page 6, line 22, insert a --,-- after "is".

On page 6, line 22, insert a --,-- after "case".

On page 6, line 26, cancel the "-" and substitute therefor a --,--.

On page 6, line 27, cancel the "-" and substitute therefor a --,--.

On page 6, line 28, cancel "figure" and substitute therefor --Figure--.

On page 7, line 3, insert a --,-- after "of".

On page 7, line 3, insert --for-- before "example".

On page 7, line 3, insert a --,-- after "example".

On page 7, line 3, cancel "for".

On page 7, line 4, cancel "figure" and substitute therefor --Figure--.

On page 7, line 4, cancel "single-" and substitute therefor --single-stage--.

On page 7, line 5, cancel "can".

On page 7, line 5, insert --can-- after "also".

On page 7, line 12, insert --present-- before "invention".

On page 7, line 14, insert a --,-- after "shows".

On page 7, line 14, insert a --,-- after "example".

On page 7, line 23, insert --present-- before "invention".

On page 7, line 23, cancel "figure" and substitute therefor --Figure--.

On page 7, line 38, cancel "figure" and substitute therefor --Figure--.

On page 8, line 13, cancel the "-" and substitute therefor a ",".

On page 8, line 14, cancel the "-" and substitute therefor a ",".

On page 8a, line 1, cancel the "-" and substitute therefor a ",".

On page 8a, line 1, cancel the "-" and substitute therefor a ",".

On page 9, line 4, insert --present-- before "invention".

On page 9, line 6, cancel "," and substitute therefor a ";".

On page 9, line 7, insert a --,-- after "example".

On page 9, line 9, cancel "according to" and substitute therefor --of--.

On page 9, line 10, insert --present-- before "invention".

On page 9, line 11, cancel "figure" and substitute therefor --Figure--.

On page 9, line 31, cancel the "-" and substitute therefor a --,--.

On page 9, line 33, cancel the "-" and substitute therefor a --,--.

On page 10, line 32, insert --present-- before "invention".

On page 11, after line 10, insert the following paragraph:

--Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be thereto without

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departing from the spirit and scope of the invention as set forth in the hereafter appended claims.--

On page 15 (last page), cancel all lines of text and substitute the following therefor:

## --ABSTRACT OF THE DISCLOSURE

A method for modifying the transmission-oriented variables of a monitoring procedure wherein, in the case of variable transmission rates of ATM cells of virtual connections within an ATM communication facility, a theoretical arrival time, determined with the aid of a monitoring time derived from the transmission rate, is determined for monitoring the next ATM cell with the aid of the monitoring procedure on arrival of an ATM cell for a virtual connection and, if there is a change in the transmission rate, the theoretical arrival time is corrected by the monitoring time.--

### In the Claims

On page 12, cancel line 1 and substitute the following left-hand justified heading therefor:

### --I Claim as My Invention--

Please cancel claims 1-7, without prejudice, and substitute the following claims therefor:

8.     A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility, the method comprising the steps of:

receiving at the communication facility an ATM cell for a virtual connection;

deriving a first monitoring time from a first transmission rate of the ATM cells;

determining a theoretical arrival time for a next ATM cell using the first monitoring time;

storing, temporarily, both the theoretical arrival time and the first monitoring time in a memory unit until further updating;

deriving a current monitoring time from a current transmission rate of the ATM cells, wherein the current monitoring time is subsequent to the first monitoring time and before a further determination of the theoretical arrival time of the next ATM cell;

determining if the current transmission rate has changed from the first transmission rate;

5

correcting the theoretical arrival time, if the current transmission rate is greater than the first transmission rate, using the monitoring time, and calculating a current value of the theoretical arrival time using the current monitoring time.

9.    A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility as claimed in claim 8, wherein the theoretical arrival time is determined by adding the monitoring time last derived to the theoretical arrival time last calculated, and wherein, if there is an increase in the transmission rate of the ATM cells, the temporarily stored monitoring time is subtracted from the temporarily stored theoretical arrival time and the current monitoring time is added.

10.    A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility as claims in claim 8, wherein the theoretical arrival time is determined by subtracting the monitoring time last derived from the theoretical arriving time last calculated, and wherein, if there is an increase in the transmission rate of the ATM cells, the temporarily stored monitoring time is added to the temporarily stored theoretical arriving time and the current monitoring time is subtracted.

11.    A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility as claimed in claim 8, wherein the monitoring time is indirectly proportional to the transmission rate of the ATM cells, the proportionality being generated using a proportionality constant having a same magnitude for all the virtual connections.

12.    A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility as claimed in claim 8, the method further comprising the step of:

detecting a change in the transmission rate of the ATM cells by comparing the monitoring cells of the monitoring time last derived with the current monitoring time.

6

13.    A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility as claimed in claim 8, wherein, after calculating the current value of the theoretical arrival time using the current monitoring time, the first monitoring time is replaced by the current monitoring time and temporarily stored.

14.    A method for modifying transmission-oriented variables of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility as claimed in claim 8, wherein, the theoretical arrival time and the first monitoring time are determined using counters, wherein the theoretical arrival time, the current monitoring time and the first monitoring time are determined by individual counts, and wherein the counts representing the theoretical arrival time and the first monitoring time are temporarily stored in a memory unit.

## REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification in order to conform the specification to the requirements of the United States Patent practice. No new matter is added thereby. Original claims 1-7 has been canceled in favor of new claims 8-14. Claims 8-14 have been presented solely because the revisions by bracketing and underlining which would have been necessary in claims 1-7 in order to present the claim in accordance with preferred United States Patent practice would have been too extensive, and thus would have been too burdensome. The amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-7 does not constitute an intent on the part of the Applicant to surrender any of the subject matter of claims 1-7.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

_(Reg. No. 39,056)_

William E. Vaughan
Bell, Boyd & Lloyd LLC
70 West Madison Street, Suite 3300
Chicago, Illinois   60602
(312) 807-4292
Attorneys for Applicants

BOX  PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE

OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER THE PATENT COOPERATION TREATY-CHAPTER II

5

| | |
|---|---|
| APPLICANT:    Herbert Heiss | DOCKET NO: 112740-151 |
| SERIAL NO: | GROUP ART UNIT: |
| | EXAMINER: |

10   INTERNATIONAL APPLICATION NO:  PCT/DE99/02926

INTERNATIONAL FILING DATE:    15 September 1999

INVENTION:    METHOD FOR MODIFYING THE TRANSMISSION-
ORIENTED VARIABLES OF A MONITORING
PROCEDURE

15

Assistant Commissioner for Patents,
Washington, D.C. 20231
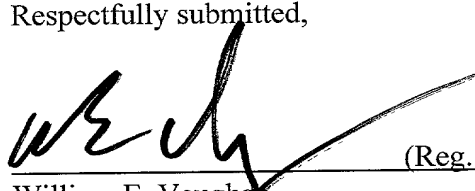
### SUBMISSION OF DRAWINGS

20

Applicant herewith submits two sheets (Figs. 1-3) of drawings for the

above-referenced PCT application.

Respectfully submitted,

25                                                                (Reg. No. 39,056)

William E. Vaughan
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois  60690-1135
30   (312) 807-4292
Attorneys for Applicant

-1-

Fig. 1

Fig. 2

Arrival of an ATM cell z at time $at_{tat}$

$at_{tat} < at_{letzt} - tol$ ?

Yes → Rejection of the ATM cell z

No

$at_{letzt} = max(at_{letzt}, at_{tat}) + pt_{letzt}$

Acceptance of the ATM cell z

Fig. 3

Arrival of the current $pt_{akt}$ in period zt

$pt_{akt} < pt_{letzt}$ ?

No

Yes

$at_{letzt} = at_{letzt} - pt_{letzt} + pt_{akt}$

$pt_{letzt} = pt_{akt}$
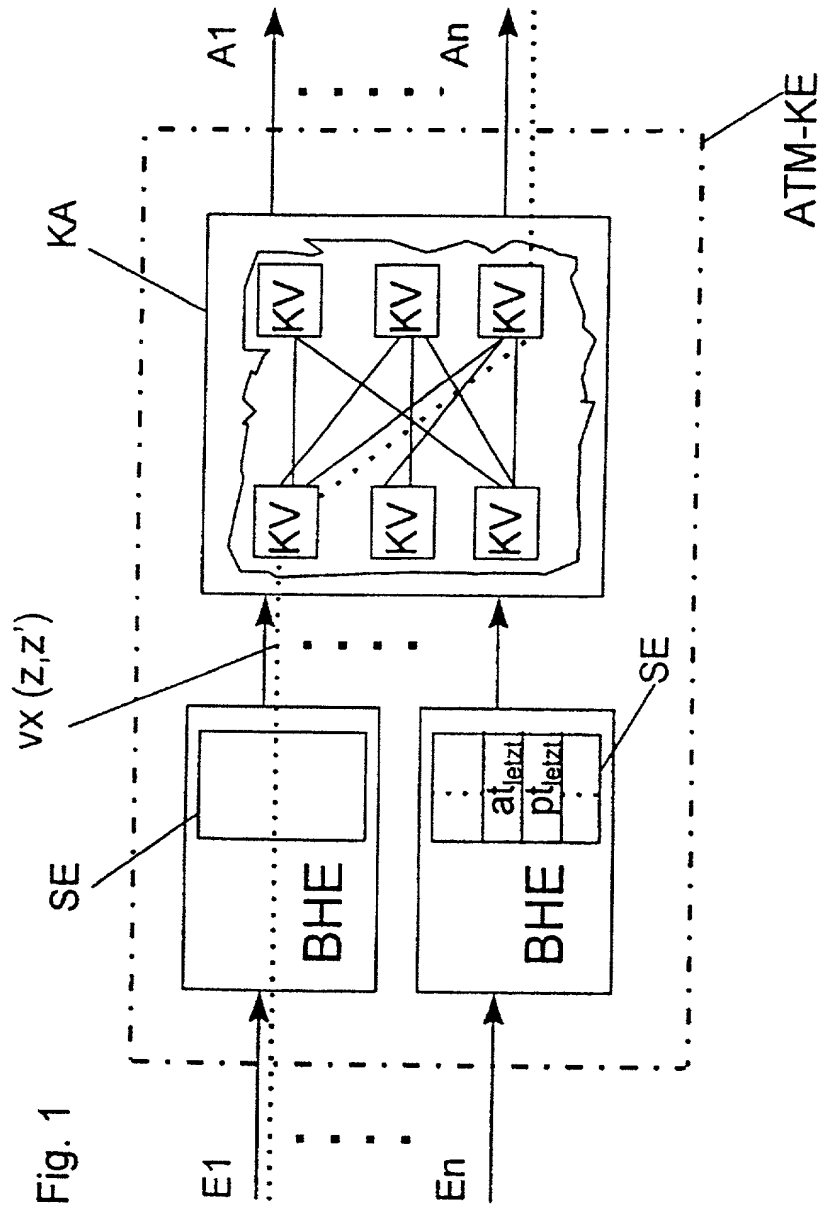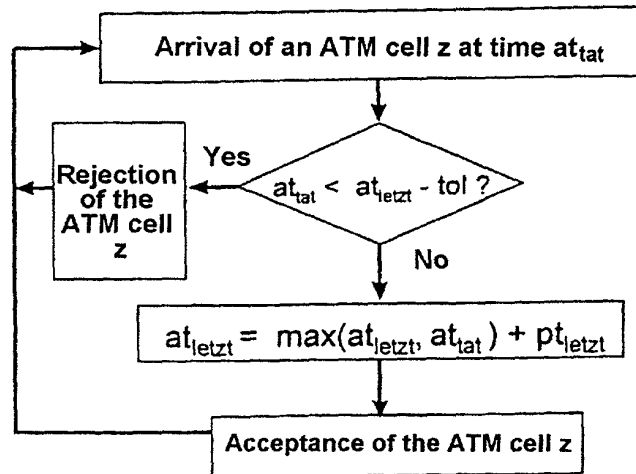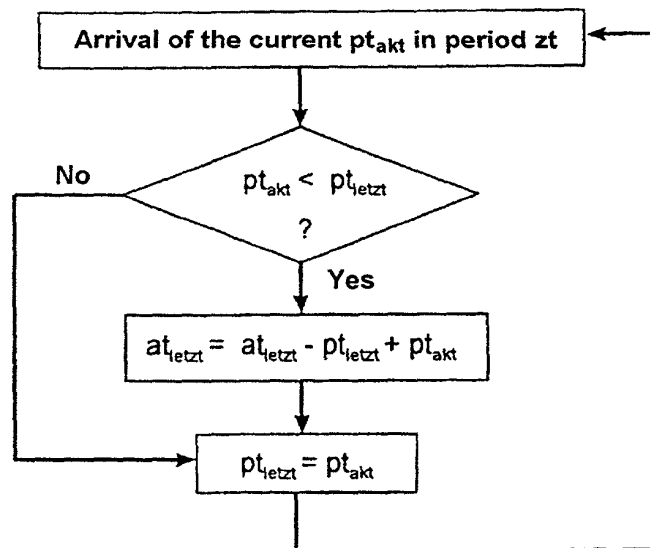
GR 98 P 2855

Description


Method for modifying the transmission-oriented variables of a monitoring procedure.

5          In existing and future packet-oriented communication systems, especially in ATM communication systems operating in accordance with the asynchronous transfer mode, individual monitoring procedures such as the "virtual scheduling algorithm" or the "continuous-

10      state leaky bucket algorithm" or other problem-solving methods are used for monitoring established transmission rates of ATM cells of virtual connections within an ATM communication network – see, for example, EP 720 411 A2 and ITU-T I.371 "Traffic control and

15      congestion control in B-ISDN", pp. 61-63, August 1996 in this respect. Said monitoring procedures or monitoring methods can be used for detecting overload situations in an ATM communication facility and then to initiate measures for eliminating such overload

20      scenarios.

          Information is increasingly transmitted via virtual connections with variable transmission bit rates. This means that the ATM cells are also transmitted at variable transmission rates. The

25      variable transmission rates of ATM cells over virtual connections make new demands on the monitoring procedures, the adaptation to variable transmission rates within the monitoring procedure, in particular, representing a problem. To this end, a monitoring

30      procedure which adapts itself to the variable transmission rate has been proposed in ITUI standard I.371.1 "Traffic control and congestion control in B-ISDN: conformance definitions for ABT and ABR", p. 15-16, June 1997. In this monitoring procedure the

35      adaptation of the last theoretical arrival time of an ATM cell – called "last virtual scheduling time" in the ITU-T standard – to the current transmission rate with the aid of a

transmission-oriented monitoring time which is added to the last theoretical arrival time is provided after the arrival of an ATM cell, this adaptation being performed before the actual arrival time of the ATM cell is checked for conformance with the transmission rate. In this arrangement, the theoretical arrival time currently determined is already matched to the current transmission rate of the ATM cell. After the check, the last theoretical arrival time is associated with the current arrival time of an ATM cell or the currently determined theoretical arrival time, depending on which of the two times has the later time information. In said method, it is required to temporarily store three transmission-rate-oriented variables per virtual connection for implementing the monitoring procedure within an ATM communication facility, this being associated with a considerable expenditure of memory capacity, especially with regard to the high numbers of virtual connections within ATM communication networks, and with an increased dynamic load on the ATM communication facility due to the reading and writing of the transmission-oriented variables.

The object forming the basis of the invention consists in improving the monitoring of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility. The object is achieved by the features of patent claim 1.

The essential aspect of the method according to the invention can be seen in the fact that, on arrival of an ATM cell for a virtual connection, a theoretical arrival time determined with the aid of a monitoring time derived from the transmission rate is determined for monitoring the next ATM cell with the aid of a monitoring procedure, both the theoretical arrival time and the monitoring time being temporarily stored in a memory unit until they are updated. After a current monitoring time ($pt_{akt}$) has been derived from the current transmission rate in the period

after the determination of the theoretical arrival time
and before the subsequent determination of the
theoretical arrival time of the next ATM cell of a
virtual connection, a check is made whether the
5     transmission rate of the virtual connection has been
changed and, if the transmission rate is increased, the
theoretical arrival time is corrected with the aid of
the monitoring time. After that, a current theoretical
arrival time is calculated with the aid of the current
10    monitoring time. An essential advantage of the method
according to the invention can be seen in the fact that
the transmission-oriented variables of a monitoring
procedure can be modified independently of the
processing by the monitoring procedure and thus the
15    transmission-oriented variables of the monitoring
procedure are already adapted to the changed
transmission rate before the next ATM cell arrives. In
this arrangement, the modification of the transmission-
oriented variables is decoupled from the monitoring
20    procedure and the modification can be performed at a
time with lower dynamic loading on the ATM
communication system. A further essential advantage of
the method according to the invention can be seen in
the fact that, due to the decoupling of the
25    modification of the transmission-oriented variables
from the monitoring procedure, the method according to
the invention can be used approximately simultaneously
for a number of monitoring procedures for established
transmission rates of ATM cells, and the monitoring
30    procedures previously used can still be used
unmodified. Furthermore, according to the method
according to the invention, two transmission-oriented
variables - the theoretical arrival time and a
monitoring time - are temporarily stored for each
35    individual connection, which leads to a reduction in
the memory capacity needed for in each case one virtual
connection in comparison to the method proposed in ITU-
T I.371.1. This means that considerably more virtual

connections can be monitored by the method according to the invention with the same memory volume.

According to a further embodiment of the method according to the invention, during the determination of the theoretical arrival time, the monitoring time last derived from the transmission rate is added to the theoretical arrival time last calculated. After that, if there is a change in the transmission rate, the temporarily stored monitoring time is subtracted from the temporarily stored theoretical arrival time last calculated and the current monitoring time is added - claim 2. This addition of the monitoring time last derived from the transmission rate to the theoretical arrival time last calculated is in agreement with ITU-I standard I.371.1.

According to a further advantageous embodiment of the method according to the invention, during the determination of the theoretical arrival time, the monitoring time last derived from the transmission rate is subtracted from the theoretical arrival time last calculated. After that, if there is a change in the transmission rate, the temporarily stored monitoring time is added to the temporarily stored theoretical arrival time last calculated and the current monitoring time is subtracted - claim 3. This subtraction of the monitoring time last derived from the transmission rate from the theoretical arrival time last calculated is in agreement with one of the "methods and system for monitoring an ATM cell stream" disclosed in EP 720 411 A2.

The monitoring time is advantageously derived from the transmission rate of the ATM cells of virtual connections, the monitoring time being indirectly proportional to the transmission rate of the ATM cells and the proportionality being generated with the aid of a proportionality constant which is of the same magnitude for all the virtual connections of a circuit - claim 4. The determination of the monitoring time is in agreement with ITU-I standards I.371 and I.371.1.

According to a further advantageous embodiment of the method according to the invention, the theoretical arrival time representing the transmission-oriented variables of a monitoring procedure and the

5    monitoring time are determined with the aid of counters, the theoretical arrival time, the current monitoring time and the monitoring time last derived from the transmission rate being determined by individual counts and the counts representing the

10   theoretical arrival time and the monitoring time last derived from the transmission rate being temporarily stored in a memory unit - claim 7. By implementing the determination of the theoretical arrival time, the current monitoring time and the monitoring time last

15   derived from the transmission rate with the aid of counters, the transmission-oriented variables representing timing information are mapped to currents and can thus be processed further in a simple manner by microprocessors. When using counters, the method

20   according to the invention can be implemented by simple circuit or programming techniques. For the "method for monitoring an ATM cell stream" described in EP 720 411 A2, too, connection-associated counts are provided in order to be able to detect a transgression of the

25   transmission rate established for the respective connection, i.e. constant transmission rate of ATM cells. The method according to the invention can thus also be used as an especially advantageous supplement for predetermined variable transmission rates of ATM

30   cells in the method described in EP 720 411 A2.

Further advantageous embodiments of the method according to the invention can be found in the further claims.

In the text which follows, the method according

35   to the invention will be explained in greater detail with reference to a block diagram and two flow charts.

Figure 1   shows an ATM communication facility suitable
          for implementing the method according to the
          invention in a block diagram,

Figure 2    shows a known monitoring procedure in a flow
            chart, and

Figure 3    shows the method according to the invention
5           in a flow chart.

        The block diagram of figure 1 diagrammatically
shows an ATM communication facility ATM-KE operating in
accordance with the asynchronous transfer mode, to
10  which a multiplicity of offering trunks E1 to En and a
multiplicity of serving trunks A1 to An are connected.
Of these, the offering trunks E1 to En and the serving
trunks A1 to An are shown by way of example in figure
1. ATM cells are transmitted via the offering trunks E1
15  to En and the serving trunks A1 to An via virtual
connections in accordance with the asynchronous
transfer mode, variable transmission rates being
provided for the transmission of the ATM cells of
virtual connections. A virtual connection vx is shown
20  by way of example by a dotted line in figure 1.
        As is shown in figure 1, each of the offering
trunks E1 to En is in each case associated with a
handling facility BHE. Such a handling facility
contains, among other things, a memory unit SE in which
25  the         connection-associated         transmission-oriented
variables - a last theoretical arrival time $at_{letzt}$ and a
last monitoring time $pt_{letzt}$ - are temporarily stored,
figure  1   only   showing   the   temporarily   stored
transmission-oriented variables $at_{letzt}$ and $pt_{letzt}$ of a
30  virtual connection vx in a handling facility BHE. The
handling facility BHE is supplied with the ATM cells
transmitted in virtual connections. In addition, the
handling   facility   BHE   carries   out   a   connection-
associated   monitoring   of   the   current   variable
35  transmission   rates   of   the   ATM   cells   of   virtual
connections with the aid of the transmission-oriented
variables. The ATM cells of a virtual connection vx are

then forwarded to a switching arrangement KA of the ATM
communication facility ATM-KE, a multi-

stage structure having a multiplicity of switching
matrices KV connected to one another being specified by
way of example for the switching arrangement KA in
figure 1. However, any type of single- or multi-stage
5  switching arrangements can also be used. Following
this, the ATM cells z of a virtual connection vx are
forwarded in a connection-associated manner to the
serving trunks A1 to An by the switching arrangement
KA. The operation of the monitoring procedure
10  implemented within the handling facility BHE and how
this is adapted by the method according to the
invention will be discussed in greater detail in the
text which follows.

　　　Figure 2 shows by way of example the flow chart
15  of the "virtual scheduling algorithm" method for
monitoring established transmission rates of ATM cells,
proposed in ITU-T I.371 "Traffic control and congestion
control in B-ISDN". In the exemplary embodiment, the
"virtual scheduling algorithm" monitoring procedure is
20  deliberately selected as a representative of the type of
"generic cell rate algorithm" monitoring procedures for
explaining the operation of the method according to the
invention. Referring to figure 1, the transmission-
oriented variables generated in a connection-associated
25  manner are stored in the memory areas of the memory unit
SE of the handling facility BHE which are associated
with the individual virtual connections. These
transmission-oriented variables are the last arrival
time $at_{letzt}$ and the last monitoring time $pt_{letzt}$, the last
30  theoretical arrival time $at_{letzt}$ of an ATM cell z of a
virtual connection vx being the theoretical arrival time
$at_{letzt}$ determined last by the monitoring procedure for
the incoming ATM cell z, assuming an established
transmission rate of a virtual connection vx. The
35  designation last monitoring time $pt_{letzt}$, in contrast, is
a value of the virtual connection vx which is indirectly
proportional to the transmission rate last established.
According to figure 2, the monitoring procedure

is activated at the actual arrival time $at_{tat}$ on arrival
of an ATM cell z and the actual arrival time $at_{tat}$ is
temporarily stored in a buffer memory of the memory
unit SE. After that, the last theoretical arrival time

5    $at_{letzt}$ is read out of the memory unit SE with the aid of
a read cycle and reduced by a connection-associated and
transmission-rate-oriented tolerance time tol, the
tolerance time tol predefining a range of tolerance
time for the acceptance of an ATM cell. If the value of

10   the actual arrival time $at_{tat}$ is greater than the value
of the last theoretical arrival time $at_{letzt}$ reduced by
the tolerance time tol, the time information exhibiting
the greater value - the last theoretical arrival time
$at_{letzt}$ or, respectively, the actual arrival time $at_{tat}$ -

15   is then determined and the monitoring time $pt_{letzt}$ last
calculated and read out of the memory unit SE is added
to this. This newly determined value represents the
calculated theoretical arrival time $at_{letzt}$ for the next
ATM cell z. The current ATM cell z is accepted and the

20   monitoring procedure is deactivated. If the value of
the actual arrival time $at_{tat}$ is smaller than the value
of the last theoretical arrival time $at_{letzt}$ reduced by
the tolerance time tol, the ATM cell z is rejected and
the monitoring procedure is deactivated. When an ATM

25   cell is rejected, the last theoretical arrival time
$at_{letzt}$ and the monitoring time $pt_{letzt}$ read out are
temporarily stored unchanged in a connection-associated
manner in the memory unit SE during a write cycle and
if not, the adapted last theoretical arrival time $at_{letzt}$

30   and the last monitoring time $pt_{letzt}$ are temporarily
stored.

On arrival of an ATM cell z of a virtual
connection vx with a changed transmission rate, the
change in transmission rate of the ATM cell z of a

35   virtual connection vx must be taken into consideration
in the calculation of the theoretical arrival time.
This can be done either by using a new monitoring

procedure - see ITU-T standard I.371.1 - or by
modifying the transmission-oriented

variables. In contrast to the method proposed in ITU-T
standard I.371.1, an additional procedure for modifying
the transmission-oriented variables is provided in the
method according to the invention, where it is possible
5    to perform this procedure between the last monitoring
procedure and the current monitoring procedure, for
example at a time with low dynamic loading.

The procedure for modifying the transmission-
oriented variables according to the method according to
10   the invention will be explained in greater detail with
the aid of the flow chart in figure 3 in the text which
follows. After the monitoring time $pt_{akt}$ has been
derived from the current transmission rate of the ATM
cells in a modification period zt, the procedure is
15   activated, the modification period zt representing the
period between the processing of the last monitoring
procedure and the processing of the current monitoring
procedure. After the monitoring time $pt_{letzt}$ determined
last from the transmission rate of the ATM cells of the
20   virtual connections and temporarily stored in the
memory unit SE has been read out, the monitoring time
$pt_{akt}$ currently determined from the changed transmission
rate of the ATM cells is compared with the monitoring
time $pt_{letzt}$ last determined from the transmission rate
25   of the ATM cells of the virtual connections. If the
monitoring time $pt_{letzt}$ last determined from the
transmission rate of the ATM cells of the virtual
connections is later in time in comparison with the
time information of the monitoring time $pt_{akt}$ currently
30   determined from the changed transmission rate of the
ATM cells - which corresponds to an increase in the
transmission rate of the ATM cells of a virtual
connection vx - the last theoretical arrival time $at_{letzt}$
is corrected as follows. The last theoretical arrival
35   time $at_{letzt}$ is read out of the memory unit SE in a
connection-associated manner. The last theoretical
arrival time $at_{letzt}$ is then reduced by the value of the
monitoring time $pt_{letzt}$ last determined from the

transmission rate of the ATM cells of the virtual connections and the value of the monitoring time $pt_{akt}$ currently determined

from the changed transmission rate of the ATM cells is added. The value of the monitoring time $pt_{akt}$ currently determined from the changed transmission rate of the ATM cells is then associated with the value of the

5    monitoring time $pt_{letzt}$ last determined from the transmission rate of the ATM cells of the virtual connections and temporarily stored in the buffer memory of the memory unit SE. If the monitoring time $pt_{letzt}$ last determined from the transmission rate of the ATM

10   cells of the virtual connection vx is earlier in time in comparison with the monitoring time $pt_{akt}$ currently determined from the changed transmission rate of the ATM cells, the value of the monitoring time $pt_{akt}$ currently determined from the changed transmission rate

15   of the ATM cells is associated with the value of the monitoring time $pt_{letzt}$ last determined from the transmission rate of the ATM cells of the virtual connection vx, and temporarily stored in the buffer memory of the memory unit SE. This concludes the

20   adaptation of the transmission-oriented variables to the changed transmission rate of the ATM cell z of a virtual connection vx. Following this, the procedure for modifying the transmission-oriented variables is deactivated in both cases. When a next ATM cell z'

25   arrives, the monitoring procedure then has available transmission-oriented variables which are already adapted to the changed transmission rate of the ATM cells. This provides for interference-free and resources-preserving monitoring of predetermined

30   variable transmission rates of ATM cells in virtual connections.

The method according to the invention explained by the exemplary embodiment is not restricted to the "virtual scheduling algorithm" monitoring procedure as

35   representative of the type of "generic cell rate algorithm" monitoring procedures but can be applied to other monitoring procedures of this form, especially the method known from EP 720 411 A2, where it is

possible to adapt the correction of the transmission-
oriented variables in a

method-oriented manner by way of the procedure for modifying the transmission-oriented variables. By this is meant, in particular, the adding or, respectively, subtracting of monitoring times $pt_{akt}$, $pt_{letzt}$ currently

5    or last derived from the transmission rate to or, respectively, from the last theoretical arrival time $at_{letzt}$ of the ATM cell, the monitoring times $pt_{akt}$, $pt_{letzt}$ currently or last derived from the transmission rate and the last theoretical arrival time $at_{letzt}$ of the

10    ATM cell being determined with the aid of counters.

Patent claims

1.　　　A method for modifying the transmission-oriented variables ($at_{letzt}$, $pt_{letzt}$) of a monitoring procedure of predetermined variable transmission rates of ATM cells of virtual connections of an ATM communication facility (ATM-KE),

- in which, on arrival of an ATM cell (z) for a virtual connection (vx), a theoretical arrival time ($at_{letzt}$), determined with the aid of a monitoring time ($pt_{letzt}$) derived from the transmission rate, being determined for monitoring the next ATM cell (z') with the aid of the monitoring procedure, both the theoretical arrival time ($at_{letzt}$) and the monitoring time ($pt_{letzt}$) being temporarily stored in a memory unit (SE) until they are updated,

- in which, after a current monitoring time ($pt_{akt}$) has been derived from a current transmission rate, in the period (zt) after the determination of the theoretical arrival time ($at_{letzt}$) and before the subsequent determination of the theoretical arrival time ($at_{letzt}$) of the next ATM cell (z') of a virtual connection (vx), a check is made whether the transmission rate of the ATM cells of the virtual connection (vx) has been changed,

- in which, if the transmission rate is increased, the theoretical arrival time ($at_{letzt}$) is corrected with the aid of the monitoring time ($pt_{letzt}$) and a current theoretical arrival time ($at_{letzt}$) is calculated with the aid of the current monitoring time ($pt_{akt}$).

2.　　　The method as claimed in claim 1, characterized in that during the determination of the theoretical arrival time ($at_{letzt}$), the monitoring time ($pt_{letzt}$) last derived from the transmission rate is added to the theoretical arrival time ($at_{letzt}$) last calculated, and

that, if there is an increase in the transmission rate,
the temporarily stored monitoring time ($pt_{letzt}$) is
subtracted

from the temporarily stored theoretical arrival time
($at_{letzt}$) last calculated and the current monitoring time
($pt_{akt}$) is added.

3.      The method as claimed in claim 1, characterized
in that during the determination of the theoretical
arrival time ($at_{letzt}$), the monitoring time ($pt_{letzt}$) last
derived from the transmission rate is subtracted from
the theoretical arrival time ($at_{letzt}$) last calculated,
and that, if there is an increase in the transmission
rate, the temporarily stored monitoring time ($pt_{letzt}$) is
added to the temporarily stored theoretical arrival
time ($at_{letzt}$) last calculated and the current monitoring
time ($pt_{akt}$) is subtracted.

4.      The method as claimed in one of claims 1 to 3,
characterized in that the monitoring time ($pt_{akt}$, $pt_{letzt}$)
is derived from the transmission rate of the ATM cells
of virtual connections, the monitoring time ($pt_{akt}$,
$pt_{letzt}$) being indirectly proportional to the
transmission rate of the ATM cells and the
proportionality being generated with the aid of a
proportionality constant which is of the same magnitude
for all the virtual connections of a circuit.

5.      The method as claimed in one of claims 1 to 4,
characterized in that a change in transmission rate of
the ATM cells is detected by comparing the monitoring
time ($pt_{letzt}$) last derived from the transmission rate
and the current monitoring time ($pt_{akt}$).

6.      The method as claimed in one of claims 1 to 5,
characterized in that after the theoretical arrival
time ($at_{letzt}$) has been adapted to the changed
transmission rate of the virtual connection (vx), the
monitoring time ($pt_{letzt}$) last derived from the
transmission rate is

replaced by the current monitoring time ($pt_{akt}$) and temporarily stored.

7.      The method as claimed in one of claims 1 to 6, characterized in that the theoretical arrival time
5    ($at_{letzt}$) representing the transmission-oriented variables of a monitoring procedure and monitoring time ($pt_{letzt}$) are determined with the aid of counters, the theoretical arrival time ($at_{letzt}$), the current monitoring time and the monitoring time ($pt_{akt}$, $pt_{letzt}$)
10   last derived from the transmission rate being determined by individual counts and the counts representing the theoretical arrival time ($at_{letzt}$) and the monitoring time ($pt_{letzt}$) last derived from the transmission rate being temporarily stored in a memory
15   unit (SE).

GR 98 P 2855

Abstract

Method for modifying the transmission-oriented
variables of a monitoring procedure

In the case of variable transmission rates of
ATM cells of virtual connections within an ATM
communication facility (ATM-KE), a theoretical arrival
time ($at_{letzt}$), determined with the aid of a monitoring
time ($pt_{letzt}$) derived from the transmission rate, is
determined for monitoring the next ATM cell ($z'$) with
the aid of the monitoring procedure on arrival of an
ATM cell ($z$) for a virtual connection ($vx$) and, if
there is a change in the transmission rate, the
theoretical arrival time ($at_{letzt}$) is corrected by the
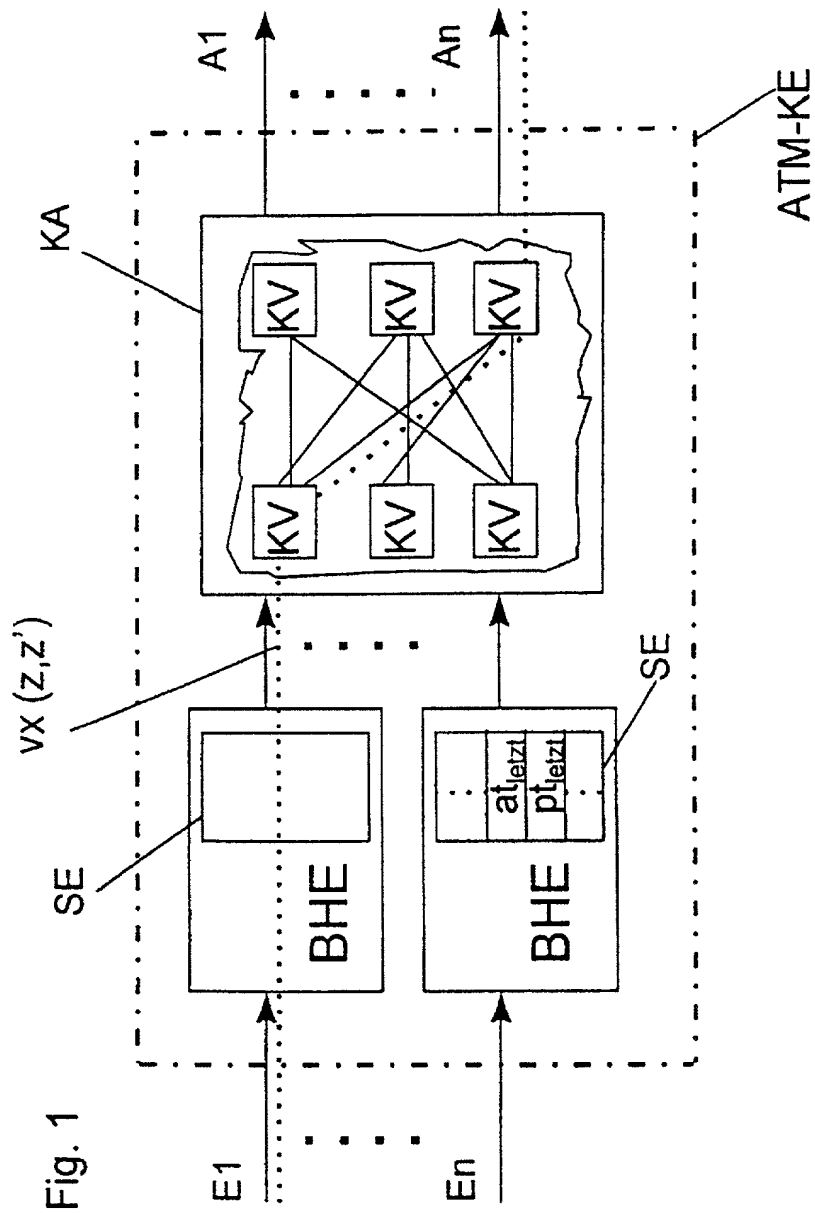monitoring time ($pt_{akt}$).

Figure 3

GR 98 P 2855

Fig. 1

Fig. 2

```
                    ┌─────────────────────────────────────────┐
              ┌────→│ Arrival of an ATM cell z at time at_tat  │
              │     └─────────────────────────────────────────┘
              │                        │
              │                        ↓
         ┌─────────┐  Yes      ╱─────────────────────╲
         │Rejection│◄──────────  at_tat < at_letzt - tol ?
         │ of the  │◄──────────╲─────────────────────╱
         │ ATM cell│                     │
         │    z    │                     │ No
         └─────────┘                     ↓
              │          ┌───────────────────────────────────────┐
              │          │ at_letzt = max(at_letzt, at_tat) + pt_letzt │
              │          └───────────────────────────────────────┘
              │                          │
              │                          ↓
              │          ┌───────────────────────────────────┐
              └─────────→│    Acceptance of the ATM cell z    │
                         └───────────────────────────────────┘
```

Diamond: $at_{tat} < at_{letzt} - tol$ ?

Box: $at_{letzt} = \max(at_{letzt}, at_{tat}) + pt_{letzt}$

Fig. 3

```
              ┌───────────────────────────────────────┐
         ┌───→│  Arrival of the current pt_akt in period zt │
         │    └───────────────────────────────────────┘
         │                       │
         │                       ↓
         │         No  ╱─────────────────────╲
         │     ┌───────  pt_akt < pt_letzt  ?
         │     │       ╲─────────────────────╱
         │     │                  │
         │     │                  │ Yes
         │     │                  ↓
         │     │    ┌──────────────────────────────────┐
         │     │    │ at_letzt = at_letzt - pt_letzt + pt_akt │
         │     │    └──────────────────────────────────┘
         │     │                  │
         │     │                  ↓
         │     │       ┌──────────────────┐
         │     └──────→│  pt_letzt = pt_akt │
         │             └──────────────────┘
         │                       │
         └───────────────────────┘
```

Diamond: $pt_{akt} < pt_{letzt}$ ?

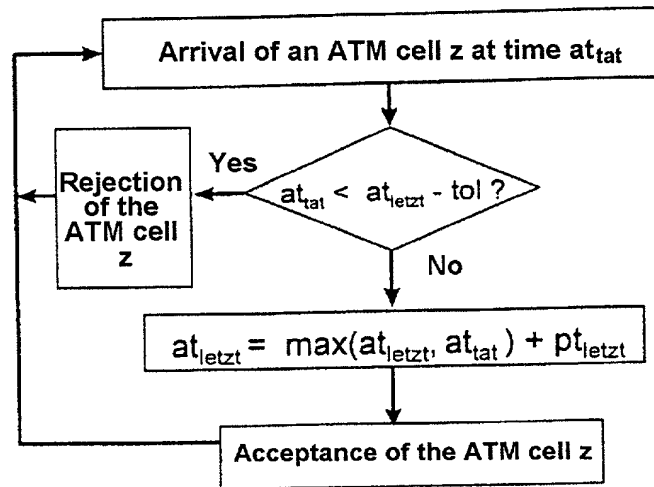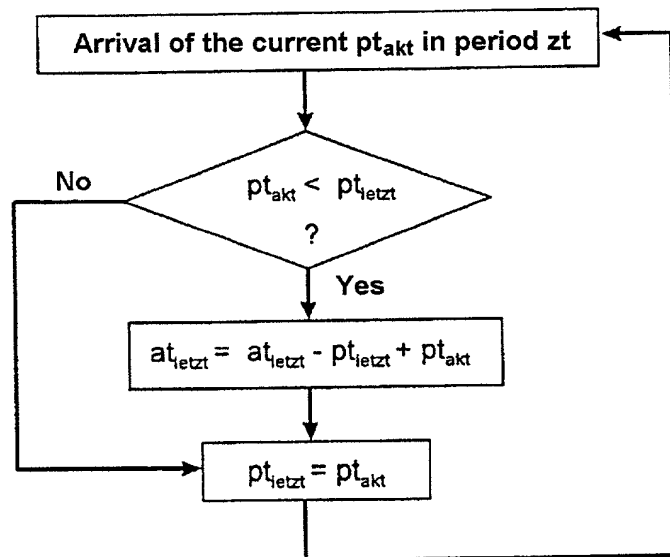Box: $at_{letzt} = at_{letzt} - pt_{letzt} + pt_{akt}$

Box: $pt_{letzt} = pt_{akt}$

| COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (Includes Reference to PCT International Applications) PCT/DE99/02926 | ATTORNEY'S DOCKET NUMBER 112740-151 |
|---|---|

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,
I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**METHOD FOR MODIFYING THE TRANSMISSION-ORIENTED VARIABLES OF A MONITORING PROCEDURE**

the specification of which (check only one item below):

☐ is attached hereto.

☒ was filed as United States application
Serial No. _____09/806,122_____

on _____March 28, 2001_____

and was amended

on _____(if applicable).

☐ was filed as PCT international application

Number _____

on _____

and was amended under PCT Article 19

on _____(if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

## PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

| COUNTRY (if PCT indicate "PCT") | APPLICATION NUMBER | DATE OF FILING (day, month, year) | PRIORITY CLAIMED UNDER 35 USC 119 |
|---|---|---|---|
| Germany | 198 44 993.3 | 30 September 1998 | ☒ YES  ☐ NO |
|  |  |  | ☐ YES  ☐ NO |
|  |  |  | ☐ YES  ☐ NO |
|  |  |  | ☐ YES  ☐ NO |
|  |  |  | ☐ YES  ☐ NO |

| Combined Declaration For Patent Application and Power of Attorney (Continued) (Includes Reference to PCT International Applications) PCT/DE99/02926 | ATTORNEY'S DOCKET NO. 112740-151 |
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I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject mater of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, Untied States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

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| U.S. APPLICATIONS | | STATUS (Check one) | | |
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| U.S. APPLICATION NUMBER | U.S. FILING DATE | PATENTED | PENDING | ABANDONED |
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PCT APPLICATIONS DESIGNATING THE U.S.

| PCT APPLICATION NO | PCT FILING DATE | U.S. SERIAL NUMBERS ASSIGNED (if any) | | | |
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

| SIGNATURE OF INVENTOR 201 | SIGNATURE OF INVENTOR 202 | SIGNATURE OF INVENTOR 203 |
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| | | |
| DATE 19 June 2001 | DATE | DATE |

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